Menlo Park Notebook #231 [N-82-08-28]

This notebook covers the period August 1882-March 1883. The entries are by Hermann Claudius and consist of calculations relating to conductors for central stations in the 28th District of New York; Milan, Italy; Roselle, New Jersey; St. Iago di Chile (Santiago, Chile); and Shamokin, Pennsylvania. Several loose pages found in the book contain additional notes and calculations regarding the New York, Roselle, and Shamokin stations. The label on the front cover is marked "Measurements of networks for electric illuminating by Hermann Claudius." There is an index on the inside front cover. The book contains 280 numbered pages.

Blank pages not filmed: 12-149, 208-239, 270-279.

XE 172
N-82-08-28

Index.

28th District of New York City . . . . page 1
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28th District

1' german silver wire (annealed) = 0.00855158 Ohm
Ratio: 1:240 or 1" = 20'. equal 289911 circ. mils copper.
1 Lamp = 140 Ohm. Def wire 0.135"
Until now (February 1st) 47147 Lamps and 3819 poles.
Insulation tested before the second wire of coils was connected and found perfect

Experiments for Mr. Strange.

10 Feeders, at 8 Chains one pole, at Mr. Strange's spans and Chains other pole. Set every southern corner one feeder and close by clamps to take potentials. Resistance of these 10 feeders in multiple are but connected together at end: 0.0232138 Ohms, temp: converted to 71° F.

Feeder 1^b 95^m = 97^c feeder 1^f 70^m
" 2^c 90^m " 2^f 66^c
" 3^c 96^c Sect. 1 " 7^f 81^c
Sect. 1 39^m

Feeder 5^d 188^c.

Potentials taken both poles at the same time.

Feeder 1^a = 200
" 2^c = 188
" 3^c = 189.5
" 4^c = 189
" 5^c = 181
" 6^c = 179
" 7^c = 182.5
" 8^c = 185
" 9^c = 185
" 10^c = 179.5

Sect. 1 = 116

Feeder 1^b = 139
" 2^c = 133
" 3^c = 155
" 4^d = 155.5
" 5^e = 150
" 6^f = 152.5
" 7^g = 158
" 8^g = 160
" 9^g = 158
" 10^g = 155

Feeder 1^a = 197.5
" 2^c = 185
" 3^c = 181
" 4^c = 178
" 5^c = 178

feeder 1^b = 136.5
" 2^d = 131
" 3^e = 162.5
" 4^f = 153
" 5^f = 147.5

Potentials at both ends at same time.

Feeder 1^a
290
Feeder 2^c
276
Feeder 3^d ... 315 ...
" 4^c — 302.5 — 312
" 5^c — 292.5 —
" 6^c — 277.5 —
" 7^c — 302 —
" 8^c — 303.5 —
" 9^c — 300 —
" 10^c — 286.5 —

Feeder 1^b Sect 1 = 114 = 2.5^m
" 2^b
" 3^b 6 H.13 = 107.5
" 4^b
" 5^b
" 6^b } H.22 = 103
" 7^b } H.33 = 99.5
" 8^b
" 9^b } H.36 = 102
" 10^b H.39 = 102.5

Short circuit Station 1 = 257

Station 1 = 257

H. 2 near pole 1^f = 122.5 ; H. 5 near feeder 2^a = 158;
" 6 " " 3^c = 144.5 " 10 " 3^a = 143.5
" 12 opposite H.13 = 106 " 14 b.h. 3^c 7^g = 105
" 7 3^a opp. H.14 = 104.5

19 5.5
12 2.1
195.6 30 | 26
24
5.0

Feeder 1 a = 195,5
" 2 a = 182,5
" 3 a = 179
" 4 a = 176
" 5 a = 175,5
" 6 a = 173
" 7 a = 176,5
" 8 a = 178,5
" 9 a = 179,5
" 10 a = 172,5

Feeder 1 b = 132,5
" 2 b = 128
" 3 b = 160
" 4 b = 150,5
" 5 b = 145
" 6 b = 147,5
" 7 b = 152,5
" 8 b = 154,5
" 9 b = 153
" 10 b = 150

Ex. on 5 feeder 1 a = 193,5

H. 8 Ex. Cor. a = 110 H. 8 Cor. p. 1 b = 102,5
H. 9 Cor. = 111 " 11 " " 4 a = 155,5
H. 20 Cor. 6 a = 144 = 115 H. 27 " H. 28 = 133,5 = 132
" 29 Ex. 4 6 a = 6 b = 115,5 H. 27,5 Ex. p. 7 a = 94,5
" 29 Ex. 4 6 a = 7 a = 94 = 43,5 %

H. 38 Cor. Cor. feeder 10 a = 10 b = 104,5

Ex. on feeder 1 b = 195,5

Febr. 6th 1883.

Feeder 1 a = 215
" 2 a = 201,5
~~" 3 a = 192~~
" 4 a = 199
~~" 5 a = 194~~

Feeder 1 b = 144,5
" 2 b = 141,5
~~" 3 b = 146~~
" 4 b = 165,5
~~" 5 b = 149,5~~

Feeder 1 H 2 = 122,5 H 2 = 131,5 H 5 = 170,5
H. 9 = 113 H. 10 = 113,5 H. 6 = 151,5 H 10 = 162,5
H. 11 = 172 H. 12 = 113,5 H 12 = 113,5 H 15 = 116
~~H. 16 = 11~~

Feeder 3 a = 193,5
" 4 a = 190,5
" 5 a = 191,5

Feeder 3 b = 133,5
" 4 b = 163
" 5 b = 157,5

H. 16 = 123,5 H. 17 = 106,5 H. 18 = 120,5 H. 26 = 139,5
H. 25 = 118,5 H. 24 = 102,5 H. 29 = 110 H. 30 = 102,5
H. 30 = 137,5 H. 30 = 152

feeder 6 a = 187,5
" 7 a = 190,5

feeder 6 b = 159,5
" 7 b = 164,5

H. 30 = 99,5 H 31 = 100 H 29 = 122,5 H
7 a = 190,5
8 a = 192,5

7 b = 164
8 b = 157,5

H. 32 = 106 H. 33 = 102,5 H 34 = 99 H 35 = 100

Feuilles $9^a = 194,5$ Feuilles $9^b = 169,5$

$10^a = 184,5$ $10^b = 160$

#36 = 166 #37 = 190 #38 = 180 #39 = 106,5

Feuille $1^a - 1^b = 307,5$ corrected when factors in section 8/2

" $1^a - 1^b = 55$ " " " " " " " 1 " "

" $1^a = 1^b = 87,5$ 1^a opposite when factor varying

" $1^a = 1^b = 150$ 1^a same contractor when factor varying as before, only were changed on ~~other~~ opposite examples

---

8/2 1883

Second series of measurements 11.

+ 6th 6 assume meet and cast 4 bars alike

− at 8 " and Maintained 8 bars

− feuille 1^a 309 + feuil. 1^a 301,5 + feuil. 1^b 301,5 − $f1^b$ 184,5

#1 = 284 #2 = 265

− $f2^a$ 274,5 + $f2^a$ = 258 + $f2^b$ 255 − $f2^b$ 249,5

#7 = 241,5 #14 = 229,5 #6 = 238 #10 = 249

9/2 1883

Summa as 8/2 1883

− feuil. 1^a 195,5 (197) + feuil. 1^b 190,5 + $f1^a$ + feuil. 1^a = 190,5 + $f1^a$ − $f1^b$ 169,5 (157)

#1 = 179,5 #2 = 167,5 #3 = 150 #4 = 179 #5 = 150 #6 = 157

$f2^a$ = 2 cents.

#7 = 134 #8 = 190 #9 = 128,5

− $f2^a$ = 180,5 + $f2^a$ = 169,5 + $f2^b$ 168 − $f2^b$ = 165

#10 = 164 #11 = 157,5 #12 = 160,5 #13 = 166

#14 = 152 #15 = 125,5 #16 = 128,5 #17 = 128,5

#18 = 129 #19 = 142

− $f3^a$ = 179 + $f3^a$ = 157,5 + $f3^b$ = 155 − $f3^b$ = 145

#20 = 140 #21 = 149,5 #22 = 149,5 #23 = 125,5

#24 = 120 #25 = 121,5 #26 = 133 #27 = 136,5

#28 = 159,5 #29 = 148,5 #30 = 121 #31 = 120

− $f4^a$ = 167 + $f4^a$ = 150 + $f4^b$ = 147,5 − $f4^b$ = 142,5

#32 = 142,5 #33 = 141 #34 = 122 #35 = 127,5

#41 = 136

− $f5^a$ = 151 + $f5^a$ = 144 + $f5^b$ = 147,5 − $f5^b$ = 146

#36 = 133 #37 = 124,5 #38 = 115 #39 = 119,5

#42 = 128 #43 = 129,5 #44 = 115

− $f1^a$ = and 209,5

8 12/2 1883

Same as 9/2 and 8/2.

$-f1^{a}=155,5$ $+f1^{c}=151,5$ $+f1^{e}=151,5$ $-f1^{g}=133$

H1=142,5 H2=133,5 H3=119,5 H4=136

H5=127,5 H6=136 H7=107 H8=103,5 H9=102

$-f2^{a}=138,5$ $+f2^{c}=130,5$ (Hm=116) $+f2^{e}=129$ $-f2^{g}=126,5$

H10=125,5 H11=120,5 H12=122,5 H13=127,5 H14=116,5

H15=96,5 H16=99 H17=95,5 H18=94 H19=100

136,5

13/2 1883

Same as 9, 8. and 12/2. 1883

$-f1^{a}=182,5$ $+f1^{c}=177,5$ $+f1^{e}=177,5$ $-f1^{g}=155,5$

H1=167 H2=155,5 H3=139 H4=158,5

H5=147,5 H6=139 H7=127,5 H8=119 H9=112,5

$+f2^{a}=162,5$ $+f2^{c}=150,5$ $+f2^{e}=149$ $-f2^{g}=145,5$

H10=145 H11=138,5 H12=133 H13=141,5

H14=146,5 H15=139,5 H16=109,5 H17=112

H18=108,5 H19=106,5 H20=124

$+f3^{a}=150$ $+f3^{c}=137,5$ $+f3^{e}=135,5$ $-f3^{g}=129$

H21=122,5 H22=126 H23=130 H24=109,5

H25=105,5 H26=115,5 H27=119

H28=138,5 H29=120,5 H30=105 H31=104

$-f1^{c}=180$

$+f4^{a}=141,5$ $+f4^{c}=129,5$ $+f4^{e}=127,5$ $-f4^{g}=128,5$

H32=123 H33=127,5 H34=105 H35=102,5

H36=116,5

$-f1^{c}=178,5$

$+f5^{a}=137,5$ $+f5^{c}=133,5$ $+f5^{e}=126,5$ $-f5^{g}=125$

H36=112,5 H37=105,5 H38=97,5 H39=100,5

H40=108 H41=104,5 H42=96,5

$-f1^{c}=176,5$

Gr. 12. Cept at end

February 19th 1893

+ Feeders moved from 6th Crossing to the west end east.

$-f1^{c}=272.5$ $+f1^{e}=242.5$ $+f1^{g}=212.5$ $-f1^{i}=202.5$

$H1=260$ $H2=197$ $H3=182.5$ $H4=238$ $H5=222.5$

$H6=211$ $H7=161$ $H8=162.5$ $H9=161$

$\cancel{H}\ 1^{c}=275$

$-f2^{c}=242$ $+f2^{e}=219.5$ $+f2^{g}=186.5$ $-f2^{i}=202.5$

$H10=222$ $H11=207.5$ $H12=201$ $H13=170$

$H14=\cancel{193}\ 173$ $H15=197.5$ $H16=182.5$ $H17=167.5$

$H18=150.5$ $H19=151$ $H20=175$

$-f1^{c}=275$

$-f3^{c}=229$ $+f3^{e}=204$ $+f3^{g}=152.5$ $-f3^{i}=179$

$H30=184.5$ $H31=192.5$ $H32=154$ $H33=143$

$H34=145$ $H35=148.5$ $H36=162$ $H37=160.5$

$H38=207.5$ $H39=170$ $H40=\cancel{149.5}\ 137.5$ $H41=137$

$-f1^{c}=274$

$-f4^{c}=215.5$ $+f4^{e}=\cancel{197}\ 189.5$ $+f4^{g}=176$ $-f4^{i}=184.5$

$H42=\cancel{214.5}\ 142.5$ $H43=140$ $H44=134$ $H45=135.5$

$H46=145.5$

$-f5^{c}=206$ $+f5^{e}=179.5$ $+f5^{g}=189$ $-f5^{i}=199$

$H46=197$ $H47=158$ $H48=135$ $H49=133.5$

$H50=163.5$ $H51=\cancel{160.5}\ 155.5$ $H52=137$

$-f1^{c}=275$ 4 [illegible] left at end

While the network decreased by order, work taken for other purposes.

Hermann Ekenchi

Milan

I 28/8 1882

1 Feder,

1. 430 — 422
428 — 421
427 — 420½

2.) 423 — 407
421½ — 406
420½ — 405

3.) ~~410 — 385~~
417 — 383
416 — 382
415 — 381

4.) 412 — 357
412 — 357

5) 409 — 340
408 — 338
407 — 338

6.) 406 — 327

7.) 405 — 320

8.) 397 — 310

9.) 396 — 309

87 22 2

396 : 87 = 4 22/87 2
— 348
— 480
— 348

II

2 Feeders

1.) 391 — 387½

2.) 391 — 382½

3.) 391 — 373

4.) 391 — 377

5.) 390 — 377

6.) 389 — 381

7.) 388½ — 370

8.) 388 — 369

III

2 Feeder moved.

1.) 388 — 383

2.) 372 — 371

3.) 372 — 361

4.) 372 — 360

IV

2 Feder mord

4) 369 – 362

2) 367 – 363

5) 367 – 359

6) 367 – 360

8) 374 – 371

2 Feder. 29/8 1882

1) 346 – 344

2.) 347 – 345

3) 347 – 349

4) 347 – 352

5) ~~347~~
344 – 347

6.) 345 – 347

7.) 346 – 346

8) ~~356 – 362~~
342 – 346

9) ~~341 – 349~~
343 – ~~359~~ 340

2. Feeder measurement

1.) 351 — 354

4.) 346 — 349

2 Feeders:

~~Last measurement~~:

1.) 347 — 346 = −1 = 0,29‰

2.) 347 — 346 = −1 = 0,29‰

3.) 347 — 350½ = +3½ = 1,00‰

4.) 348 — 351½ = +3½ = 1,00‰

5.) 349 — 349 = ±0 = 0‰

6.) 350 — 350½ = +½ = 0,14‰

7.) 349 — 347 = −2 = 0,57‰

8.) 349 — 353 = +4 = 1,14‰

9.) 350 — 346 = −4 = 1,14‰

~~202,65~~ ~~149~~ ~~664,69~~ ~~619,62~~

Length of feeder No I ~~202,65~~ m = ~~6746'~~

" " II ~~447,35~~ = ~~1467,31~~ ~~408,77~~ ~~1329,38~~ ~~408,77~~ ~~1329,38~~

1 = 0,58‰; 2 = 0,58‰; 3 = 2,02‰; 4 = 2‰;

5 = 0‰; 6 = 0,28‰; 7 = 1,14‰; 9 = 2,28‰;

9 = 2,28‰

~~Double~~ lengths of feeders in feet

I = ~~1357,92~~ 664,69 × 2 = 1329,38

II = ~~2934,62'~~ 1329,38 × 2 = 2658,76

1290 Lamps à 140 Ohm = 0.10853 Ohm = 85 %
network . . . . = 0.00319 " = 2 1/2 %
2 feeders . . . . = 0.01596 " = 12 1/2 %
0.12768 = 100 %

1 feeder therefore 0,03192 Ohm resist.

2 π = 4 tubes = 365768 circ. mils

Germantown mains represented 248258 circ. mils copper

Greatest fall, reduced to 1/2, was 2,28 %

Therefore loss in the network of 2 π = 4 tubes:

365768 : 248258 = 2,28 % : x %

x = 1,58 %

Street mains = 1,5 % = 0.00184 Ohm
Feeders = 10 % = 0.01226 "
1290 Lamps à 140 Ohm = 88,5 % = 0,10853 "
= 100 % = 0.12263 Ohm

1 feeder therefore 0,0 2 4 5 2 Ohm resistance
feeder I = 560053 circular mils
II 1120106 "

30 | VIII | 82.

total resistance of the Milan board = 0,1171175
Resistance of 1290 lamps = 0,108527
Resist. of the giving feeder = 0,002988
" of the return feeder = 0,003054
together 0,006042 − 0,006042
0,114569 − 0,114569
Resistance of the street mains = 0,002548 5

measured at 78° F.

Hf
Lamp.

664,69' tubes π 2 1/2 } feeders
1329,38' " " 1 1/2 }
2 743,33' " " 4 street mains.

Greenpoint
Aug: 30th 1882.

Claudius
786

4) 0.108527 = 93 %
0.006042 = 5 %
0.002548 = 2 %
0.117117 = 100 %

The greatest difference was 1,14 % only and can temperature alone not be of so great an influence. CL.

Milan:

1375 L'Scala
2471 Metmark
3846 Lamp

Test for insulation before soldering the second wire:
Bells, high resist. galv.:
Deflect. 0.

8/9 1882

I.

1.) 386 – 385½ = ½
2.) 378 – 375½ = 2½
3.) 379 – 379 – 0
4.) 397 – 378
5.) 374½ – 401½
6.) 372½ – 382½:

7.) 370 – 381½
8.) 373 – 385
9.) 370 – 407½
10.) 370 – 388
11.) 370 – 384
12.) ~~369~~ – 384 = 368
13.) 370 – 389
14.) 369 – 383½
15.) 370 – 379
16.) 369 – 377½

II

1.) 384 – 386
2.) 386 – 386
3.) 386 – 387
4.) 385 – 396
5.) 386 – 400
6.) 386 – 396
7.) 385 – 397
9.) 385 – 386
8.) 388 – 403

10.) 387 – 391
11.) 387 – 388½
12.) ~~389 – 390~~
390 – 388
13.) 385 – 391
14.) 385 – 385
15.) 385 – 380
16.) 385 – 380

III

1.) 380 – 382½
2.) 380 – 379
3.) 380 – 386
4.) 380 – 391
5.) 380 – 396

4.) 381 – 391½
7.) 381 – 391½
8.) 380 – 395
9.) 381½ – 386½
10.) 380½ – 385½
11.) 380½ – 383
12.) 380½ – 381½
13.) 381 – 383
14.) 381 – 387½
15.) 381 – 388
16.) 381 – 384½

IV

1.) ~~385~~ – 385½
3.) 385 – 385½

4.) 384 – 395
5.) 385 – ~~386~~ 390
6.) 385 – 389
11.) 385 – 385
12.) 385 – 385½
13.) 385 – 386
14.) 385 – 391½
15.) 385 – 399½
16.) 385 – 389½

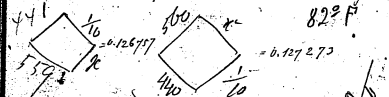
V. 9/9/1882

1.) ~~449 – 401~~
398 – 399½ = +1½
2.) 398 – 397 = –1

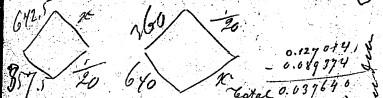
3.) 397½ – 398 = +½
4.) 395 – 405½ = +10½
5.) 398 – 392½ = –5½
6.) 392 – 401½ = +9½
7.) 391 – 402 = +11
8.) 390 – 404 = +14
9.) 389 – 392½ = +3½
10.) 387½ – 390 = +3½
11.) 387½ – 388½ = +1
~~12.) 385½ –~~
12.) 385 – 385 = 0
13.) 385½ – 385 = +½
14.) 386 – 391 = +5
15.) 384½ – 391½ = +7½
16.) 383 – 387 = +4

Distance from I. Station to Tred. I 0,807 = 188,03
616,73'
" " 1084,43' " II 1,419 = 330,62
" " 1645,57' III 2,155 = 501,64
" " 1581,97' IV 2,071 = 482,31

Measurement of the whole network 822 F.



Measurement of the feeders



0.127 0441
− 0.089374
Cotse 0.037640
− Bumpo 0.036402
0.001238
0.089374
remains for theatre

0.001238 = c. 3% of 100% or 0.0412715 and (ratio 8/14 = 3/7 = 0.42857) of 390.

Scale theatre cut off 1 feeder.

~~1) 355 = 356~~
2) 334 – 332
3.) 333 – 333½
4) 332 – 342
1.) 331 – 332
5) 330 – 337½
6) 332 – 340
7.) 332 – 340½
8.) 332 – 341½
9.) ~~329~~ 331½ – 329
10.) 331½ – 345
11.) 331½ – 346
12.) 330½ – 345½
14.) 330 – 348

14.) 330 – 353½
15.) 329 – 354

Street mains 1,8 %
Feeder 10 %
Lamps 88.2
100 %

Gemeinschaft: 1' = 0.0085 5158 Ohm
1:233
5798:29' Street

346 Lamps 88,2 % = ~~0.0412715~~ Ohm (≈ 14006) 0.0364015 Ohm
4 Feeders 10 % = 0.0041271 "
Street mains 1.8 % = 0.0007429 "
100 % = 0.0412715 Ohm

Resistance of every feeder: a 0.0165084 Ohm

I = 1233·46' à 771830 circmils Nr. I
II = 2168·86' à 1357146 " " 2 à Nr. 2½
III = 3290·74' à 2059155 " " (2056177 ist 88½ in the lamp) 2 à Nr. 1½
IV 3163·94' à 1979810 " " 2 à Nr. 1½
Street mains 5798.29' tubes Nr. 4.

11/9 1888

Bridgemore.

1.) 331 – 330 Δ-1
2.) ~~326~~ 327½ – 326 Δ-1½
3.) 326½ – 327½ Δ+1½
4.) 325½ – 331 Δ+4½
5.) ~~327~~ 325½ – 326 Δ+½
7.) 325 – 331½ Δ+6½
6.) 325 – 330 Δ+5
8.) 325 – 332½ Δ+7½
9.) 325 – 327½ Δ+2½
10.) 325 – 330 Δ+5
11.) 325 – 327 Δ+2
12.) 324 – 325½ Δ+1½
13.) 324 – 326 Δ+2
14.) 324 – 330 Δ+6
15.) 324 – 330½ Δ+6½
16.) 324 – 328 Δ+4

The feeder lamp mains to the feeder I

1.) 344½ – 324½ Δ-20
2.) 345 – 321½
3.) 345 – 324
4.) 344½ – 329
5.) 345 – 324
6.) 344½ – 327½
7.) 345 – 329½
8.) 344½ – 330
9.) 344 – 325
10.) 343½ – 326
11.) 342½ – 323½
12.) 342 – 322
13.) 342 – 324½
14.) 342 – 326½
15.) 342 – 328
16.) 342 – 324½

The Milan network gets 1 thermopile for every feeder (10 Ohm resist. galvanometer).

P I 78 P II 62 P III 61 P IV 79

846 Roselle. $\lg = 0.9476909 - 1$

~~845~~ $0.8865 = 2490$ Ohm

~~840~~ Series à 750 Ohm = ~~0.8875 740~~ ~~0.8925 8574~~ Ohm

Insulation: 5 cells in series, highest.

Gals: Defl: 0

Transcripts 15 Jy 1882

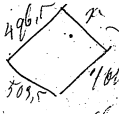
Chambers

By the wire on this network, resistance of 1 foot = 0.0177 67035 Ohm, are represented ~~339~~ 339837 circular mil of copper (lg = 5.531 2699). Ratio to nature 1:584.5. One circ mil copper = 10.33 Ohm.

Resistance of copper on G.S. wire: 1:20.434

19/9 1890

Measurements of resistance of the whole system.



2.6959193
2.7019995
0.9939198 − 1
0.9860973
0.9661261.9

Ratio of cells at terminals 0.019735 difference 0.05 means in nearly 2% of the cells.

Clarke

Without any leader between centrestation and the two farest houses on every side there was a difference of pressure between 5 – 6%; if groundconnection it would be only 2½ – 3%, sufficient for overhead wires, which cannot become hot so easy.

3 feeders: I. Measurement.

20/9 1882.

1.) 346 – 349 + 3
2.) 346 – 349 + 3
3.) 346 – 350 + 4
4.) 346 – 350 + 4
5.) 346 – 351 + 5
6.) 346 – 350 + 4
7.) 346 – 347 + 1
8.) 347 – 347 ±0
9.) 344½ – 344½
10.) 344½ – 343½ – 1
11.) 344 – 345 + 1
12.) 344 – 343 – 1
13.) 344 – 342 – 2
14.) 343½ – 343 – ½
15.) 344 – 343½ – ½
16.) 344 – 344 ±0
17.) 341½ – 341½ 0
18.) 342 – 341½ – ½
19.) 342 – 342 – 0
20.) 342 – 342½ + ½
21.) 342 – 343 + 1
22.) 342½ – 343 + ½
23.) 343 – 344½ + 1½
24.) 343 – 345 + 2
25.) 343 – 345 + 2
27.) 343 – 346 + 3
28.) 343 – 346½ + 3½

Clarke

21/9 1882. (mostly air) Middle face nearly.

~~1.) 340 – 340~~

1.) 366 – 366 = 0

2.) 364 – 364½ + ½ = +0.14%

3.) 363½ – 365 + 1½ = +0.14%

4.) 362½ – 364½ + 2 = +0.57%

5.) 362½ – 365 + 2½ = +0.69%

6.) 362 – 362½ + ½ = +0.14%

7.) 361 – 359½ – 1½ = –0.42%

8.) 360 – 358 – 2 = –0.56%

9.) 360 – 357 – 3 = –0.83%

10a) 360 – 358½ – 1½ = –0.42%

10b) 359½ – 359½ = 0

11.) 359½ – 359½ = 0

12.) 359½ – 357½ – 2 = –0.55%

13.) 359 – 356½ – 2½ = –0.69%

14.) 358½ – 357 – 1½ = –0.41%

15.) 360 – 358 – 2 = –0.55%

16.) 360 – 358½ – 1½ = –0.42%

17.) 359 – 357½ – 1½ = –0.41%

18.) 358½ – 355 – 3½ = –0.97%

19.) 358 – 357 – 1 = –0.28%

20.) 358 – 356½ – 1½ = –0.42%

21.) 357½ – 356½ – 1 = –0.28%

22.) 357 – 356 – 1 = –0.28%

23.) 356½ – 356½ = 0

24a) 356½ – 355½ – 1 = –0.28%

24b) 356 – 355 – 1 = –0.28%

24c) 355½ – 355½ = 0

25.) 355½ – 354 – 1½ = –0.42%

26.) 355 – 354 – 1 = –0.28%

27.) 355 – 356½ + 1½ = +0.42%

28.) 355 – 356½ + 1½ = +0.42%

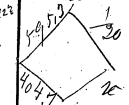
Clewring

J. Thomp

26/9 1882

Measurements of the 3 faces

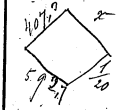
Calcul:



74°F

2.607 1332
2.774 7359

0.833 3973 – 1 = 0.679825
34
0.0399125



2.609 9144
2.772 8949

0.837 0795 – 1 = 0.687194
27
0.0743597
0.0683509
0.0341754

Pa = 0.0341754

Clewring

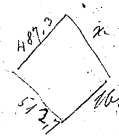
J. Thomp

27. Sept. 1882. 77°5

Whole System:

2.685 1145
2.712 3971
0.972 7174 − 1
9

4939112
950460
1889572
9446786
− 0.634175 = Ires
9910611



2.687 7964
2.709 8633
0.977 9331 − 1

Whole Resist. 0.910611

− Lampcails: 0.882574

0.023037 = Resist of thermometer

100 ° ; if 0.910611 = 88 ° : 1.0348

1½ = 0.010348

2° = 0.02 0696, therefore

above almost exactly 2°.

Readers on the same places, like 21/9 1882, page 172.

1.) 317,5 = 318+0,5
2.) 317 = 317,5 + 0,5
3.) 316,5 = 317,5 + 1
4.) 315,5 = 317 + 1½
5.) 314,5 = 317 + 2½
6.) ~~312~~ 357,5 = 957,5 = 0
7.) 354 = 352 = 2
8.) 352 = 350 = 2
9.) 351 = 348 = 3
10.) 350½ = 349 = 1½
11.) 350 = 350 = 0
12.) 349 = 349 = 0
13.) 348 = 346½ = 1½
14.) 347½ = 345 = 2½
15.) 347 = 345 = 2
16.) 346 = 344½ = 1½
17.) 345½ = 344½ = 1
18.) 344½ = 342 = 2½
19.) 344 = 342 = 2
20.) 343½ = 341½ = 2
21.) 343 = 342½ = ½
22.) 342½ = 341½ = 1
23.) 342 = 341½ = ½
24.) 341½ = 341½ = 0
25.) 341 = 340½ = ½
26.) 340½ = 340 = ½
27.) 340 = 339½ = ½
28.) 340 = 339½ = ½
29.) 340 = 341 + 1

The two outside feeders moved.

1) 934 ÷ 934 ÷ = 0
2) 935 − 935 = 0
3) 935 − 935 = 0
4) 935 − 935 = 0
5) 935 − 936 + 1
6) 935 − 936 ÷ + 1½
7) 935 − 933 − 2
8) 934 − 934 = 0
9) 934 − 934 − 1
10) 933 ÷ − 932 − 1½
10) 933 − 933 = 0
11) 933 − 933 ÷ + ½
12) 933 − 933 = 0
13) 933 − 932 − 1
14) 933 − 933 = 0
15) 933 − 933 = 0
16) 933 − 933 = 0
17) 933 − 932 ÷ − ½
18) 933 − 933 ÷ − ½
19) 933 − 932 − 1
20) 933 − 932 ÷ − 1
21) 933 − 932 ÷ − ½
22) 933 − 932 ÷ − ½
23) 933 − 933 = 0
23) 932 ÷ − 933 + ½
24) 932 ÷ − 932 − ½
24) 932 ÷ − 932 ÷ = 0
25) 932 ÷ − 932 − ½
26) 932 ÷ − 932 − ½
27) 932 ÷ − 933 ÷ + 1
28) 932 ÷ − 933 + ½

70 c p. H Kemp
A Claudin

Whole system with 2 feeders moved.

2.6869643
2.710 7586
24 = 61147 − 1 = 0.946662

2.6836470
2.7783292
Claudin
H Kemp
0.968.7172 − 1 = 0.9305

18.77164
2 0.9 26582
− Lamp poles 0.887574
0.051008
− Mines 0.034175
0.016833
Resist of street mains . . . 0.020996
2% page 174 . . . .
therefore less than 2%.

28/9 1882 Fach I mass

1) 994 x − 993 − 1 = 0.29%
2) 994 − 993 − 1 = 0.29%
3) 994 − 992½ − 1 = 0.47%
4) 994 − 992½ − 1½ = 0.44%
5) 993½ − 993 − ½ = 0.14%
6) 993 − 995 + 2 = 0.6%
7) 993 − 992 − 1 = 0.3%
8) 993 − 990½ − 2½ = 0.75%
9) 992½ − 990 − 2½ = 0.75%
10) 992 − 991 − 1 = 0.3%
11) 992 − 992 = 0
12) 992 − 991½ − ½ = 0.15%
13) 991½ − 990½ − 1 = 0.3%
14) 991 − 991 = 0 Olanda
15) 991 − 991 = 0
16) 992 − 991½ − ½ = 0.15%
17) 992 − 991 − 1 = 0.3%
18) 992 − 990½ − ½ = 0.6%
19) 991½ − 990½ − 1 = 0.3%
20) 991½ − 990½ − 1 = 0.3%
21) 991 − 991 = 0
22) 991 − 990½ − ½ = 0.15%
23) 991 − 990½ − ½ = 0.15%
24) 990½ − 990½ = 0
25) 990½ − 990½ = 0
26) 992 − 991 − 1 = 0.3%
27) 992 − 992½ + ½ = 0.15%
28) 992 − 991½ − ½ = 0.15%

Whole system 94 #

485 x 515 1 Ohm

2.6857417
2.711 8072
0.9739372 − 1 = 0.941748

517 1 Ohm 489 x

2.6839471
2.7334925
0.9704566 − 1 = 0.934236
282) 1.875984
0.937992 Ohm

517 1 ohm Ohm 489 x

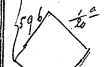
Resist

485 x 515 1 ohm Ohm

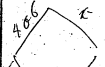
2.6857417
Olanda

3 feeders, Resistance: 74°F

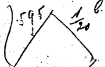
2.6079909
2.7741512
0.8338390 − 1 = 0.68208



2.6063814
2.7752463
0.8314351 − 1 = 0.67785
1.35693
2x) 0.679765



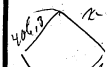
2.6085260
2.7737864
0.8347596 − 1 = 0.69950
0.68067
1.36417
2x) 0.682085



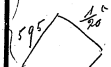
2.6074550
2.7745770
0.8329380 − 1 = 0.68067
2x) = 0.034034

Hemp

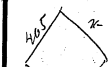
74°F

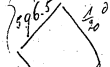


2.6088468
2.7735670
0.8352798 − 1 = 0.68435
0.68067
1.36502
2x) 0.682510



2.6074550
2.7745770
0.8329380 − 1





2.6058435
2.7756104
0.8302331 − 1 = 0.67645
0.68067
1.35712
2x) 0.67856

0.68208 − 2) 0.679965
0.69785 − 1) 0.6822085
0.68550 II) 0.6822510
0.68067 III) 0.6822510
0.68435 IV) 0.6878560
0.67645 V) 0.6780490
0.68067 0.2723920
0.68081 0.6807980
0.034042 2) 0.0340390

Hemp

Resistance of the whole system

0.937992 Ohm

systems à 750 lb. 0.887574 "

0.050418 Ohm

3 feeders . . . 0.037039 "

Streetmains 0.016279 Ohm

Clending

Length of the streetmains 273.417' × 2 = 546.28.34'

" of feeder I. 504.9' × 2 = 1009.8

" " II. 2169.6' × 2 = 4339.2

" " " III. 2320.8' × 2 = 4641.6

88 : 100 = 0.887574 : x

x = 1.0086 = 100 %

0.010086 = 1 %

0.020172 = 2 %

0.10086 = 10 %

0.30258 Ohm one feeder

Circul: mils of the feeder.

I. 34474 circ. m.

II 148139 " "

III 158463 " "

Streetmains: the german-silver wire represented 339837 circ. m.

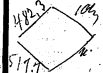
$\frac{1}{3}$ of it = 113279 circ. mils

Clending.

7/10 1889

Measurement of Duellenstreets, 4 feeders

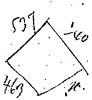
2.6839471
2.7134905
0.9704566 − 1 = 0.934236
28



2.6833173
2.7140782
0.969 2391 − 1 = 0.931621
1.865857
0.93 2924

Specimen alone 77°F

2.665 2995
2.730 2168
0.935 08 27 − 1 = 0.86 1157
2 5 6
39

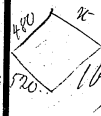


2.665 8810
2.729 9743
0.935 60 64 − 1 = 0.861497
77 1.723354
2 0.861677
0.0015419

Total 0.932928

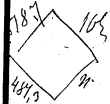
Wires 0.021542 −0.909116
Lamps 0.887574 | 0.023812
0.909116

Measurements of the whole network 185



76°F.

2.681241 2
2.736 0033
0.965 23 79 − 1 = 0.923077



2.682 4159
2.714 9162
0.967 5 995 − 1 = 0.927897
72
1.850974
0.925487

Total 0.925487
0.909116
0.016371

9/10-1882

4 feeders.

1) 422 ½ - 420 - 2½ = 0.59%
2) 422 ½ - 420 - 2½ = 0.59%
3) 422 - 421 - 1 = 0.24%
4) 422 - 421 - 1 = 0.24%
5) 422 - 422 - 0 = 0 %
6) 420 - 422½ - ½ = 0.12%
7) 421 - 421 = 0 %
8) 422 - 422½ - ½ = 0.12%
9) 423 - 422 - 1 = 0.24%
10a) 423 - 421½ - 1½ = 0.35%
10b) 422½ - 422½ = 0
11) 423½ - 420 - 3½ = 0.83%
423 - 419½ - 3½ = 0.83%
12) 423 - 417½ - 5½ = 1.30%
13) 422½ - 416 - 6½ = 1.54%
14) 423 - 417 - 6 = 1.42%
15) 423 - 417 - 6 = 1.42%
16) 422½ - 417½ - 5 = 1.18%
17) 422 - 417 - 6 = 1.42%
18) 422 - 416½ - 5½ = 1.30%
19) 425 - 420 - 5 = 1.18%
20) 424½ - 420 - 4½ = 1.06%
21) 424½ - 420½ - 4 = 0.94%
22) 424 - 420 - 4 = 0.94%
23a) 424 - 421 - 3 = 0.71%
23b) 424 - 420½ - 3½ = 0.83%
24a) 424 - 422 - 2 = 0.47%
24b) 424 - 422 - 2 = 0.47%
25) 424 - 420½ - 3½ = 0.83%
26) 424 - 420 - 4 = 0.94%
27) 424 - 422½ - 1½ = 0.35%
28) 424 - 422½ - 1½ = 0.35%

Feeders marked

1) 319½ - 318½ - 1 = 0.31%
2) 319½ - 318 - 1½ = 0.47%
3) 319 - 317½ - 1½ = 0.47%
4) 318½ - 316½ - 2 = 0.62%
5) 318½ - 317½ - 1 = 0.31%
6) 318½ - 317½ - 1 = 0.31%
7) 318 - 315½ - 2½ = 0.78%
8) 318 - 315 - 3 = 0.94%
9) 317½ - 313½ - 4 = 1.26%
10a) 317½ - 316½ - 1 = 0.31%
10b) 319 - 319 - 0 = 0 %
11) 319 - 315½ - 3½ = 1.09
12) 319 - 316½ - 2½ = 0.78%
13) 318½ - 315 - 3½ = 1.09%
14) 318½ - 315½ - 3 = 0.94%
15) 318½ - 315½ - 3 = 0.94%
16) 318½ - 315½ - 3 = 0.94%
17) 318½ - 315 - 3½ = 1.09%
18) 318½ - 314 - 4½ = 1.41%
19) 318 - 314½ - 3½ = 1.10%
20) 318 - 314½ - 3½ = 1.10%
21) 318 - 315 - 3 = 0.94%
22) 318 - 315 - 3 = 0.98%
23) 318 - 315½ - 2½ = 0.79%
24a) 317½ - 315½ - 2 = 0.63%
24b) 317½ - 316 - 1½ = 0.47%
24c) 317½ - 316½ - 1 = 0.31%
25) 317½ - 315 - 2½ = 0.79%
26) 317½ - 315½ - 2½ = 0.79%
27) 317½ - 317½ - 0 %
28) 317½ - 317½ - 0 %

10/10.1892 4 feeders one moved.

1) 949 – 944½ + 1½ = 0.44%
3) 997 – 997½ + ½ = 0.14%
5) 996½ – 998 + 1½ = 0.44%
7) 994½ – 995½ + ½ = 0.15%
9) 994½ – 993½ – 1 = 0.29%
10 a) 994½ – 994½ = 0%
12) 993½ – 993½ = 0%
14) 993½ – 993 – ½ = 0.15%
16) 993 – 992½ – ½ = 0.15%
18) 992 – 991½ – 1½ = 0.45%
20) 992½ – 992 – ½ = 0.15%
22) 992½ – 992 – ½ = 0.15%
23 b) 992 – 993½ + 1 = 0.30%
24 b) 991½ – 993 + 1½ = 0.45%
26) 991½ – 992 + ½ = 0.15%
28) ~~991½ – 994 + 2½ = 0.75%~~
991½ – 991 + 2½ = 0.75%
30 a) 992 – 990½ – 1½ = 0.45%

Dynamo running always, induction-currents, permanent effect impossible.

4 feeders ~~two~~ moved.

1) 992 – 992 = 0%
2) 992 – 992 = 0%
3) 992 – 992½ + ½ = 0.15%
4) 991½ – 992½ + 1 = 0.30
5) 991½ – 989 + 1½ = 0.45%
6) 991 – 992½ + 1½ = 0.45%
7) 991½ – 991½ = 0%
8) 991½ – 990½ – 1 = ~~0.45~~ 0.30%
9) 991½ – 990 – 1½ = 0.45%
10 b) 991 – 990 – 1 = 0.30%
10 c) 991 – 991 = 0%
11) 991 – 990 – 1 = 0.30%
12) 991 – 990½ – ½ = 0.15%
13) 991 – 990 – 1 = 0.30%
14) 991 – 990 – 1 = 0.30%
15) 990½ – 990 – ½ = 0.15%
16) 990½ – 990 – ½ = 0.15%
17) 990½ – 989 – 1½ = 0.45%
18) 990 – 988½ – 1½ = 0.45%
19) 990 – 988½ – 1½ = 0.45%
20) 990 – 989 – 1 = 0.30%
21) 990 – 990 = 0%
22) 990 – 989 – 1 = 0.30%
23 a) 990 – 990 = 0%
24) ~~990~~ 990 – 990½ + ½ = 0.15%
25) 989½ – 990 + 1 = 0.30%
26) 989½ – 989½ = 0%
27) 989½ – 990½ + 1 = 0.30%
28) 989½ – 991 + 1½ = 0.45%

Observations
MB
Lemp

846 Sonia à 750 Ohm = 0.8865249
2% = 0.0201482 92
100% = 1.0074146 | 10% = 0.100741 46
Total = 1.0674146,52

Mino-park 13th/X/82.

Being ably assisted by Mr Clubbis I have been able to step in our measurements in the "Roelli" district by getting as result nonance. Mr Clubbis heard me to double every Resistance coil and that each one of strains are short-circuited.

In the following all figures found in the spools are registered and the bad ones are changed on the board so as the letter will be entirely according with the map.

Block 3.

5 series coils (150 Ohm) is made as shows. Sketch

1)

→ one 100 Ohm coil

then two 100 Oh in multiple are respectively by the 50 Ohm and the letter in series are 150 Oh.

one of the two 100 Ohm coils joined in multiple are not found broken. the current past in through two 100 Ohm coils in series.

therefore resistance instead of 150 Ohm = 200 Ohm.

Block 5.

the same case as in block 3.
R = 200 Ohm instead of 150.

Block 4.

the same case as in block 3.
R = 200 Ohm instead of 150.

Block 9

the same case as in block 3.
R = 200 Ohm. instead of 150.

Block 14.

one street lamp coil (750 Ohm) mentioned on the map not put on the board.
Resistance in this place therefore raised to ∞. 750. 0 = ∞.

Block 25.

one 5 serie lamp coil
150 Ohm represented in one single coil and not in three ~~[illegible]~~ sometimes right
therefore probably wire broken inside.
Res = ∞ instead of 150 Ohm.

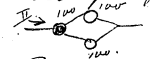
Block 30.

1) the same case as in block 3.
R = 200 Ohm instead of 150.

2). one of the street lamp coils (750 Ohm) sometimes right
" " no current.
R = ∞ instead of 750.

Block 33.

1) one of the three 100 Ohm coils stream-less and because it's the, as shown sketch II no current at all passing through the 3 coils.



R = ∞ instead of 750.

2) ~~Block~~ same case as in block 3.
therefore R = 200 Ohm instead of 150.

Block 36.

same case as in block 3.
R = 200 O. instead of 150

Block 34

same case as in block 3.
R = 200 O. instead of 150.

In our calculations.
the joint Resistence of 845 series
was taken = 0,887574 .... ohm.
of this 845 series
only 793. correct.
12 series no current
and 8. 150 ohm coils = 200 ohm
so we had a resistance =

$$= \frac{\frac{750}{793} \cdot \frac{200}{8}}{\frac{750}{793} + \frac{200}{8}} = 0,9113 \text{ ohm}$$

right R. 0,887574.
bad R. 0,9113
diff. 0,023726 ohm

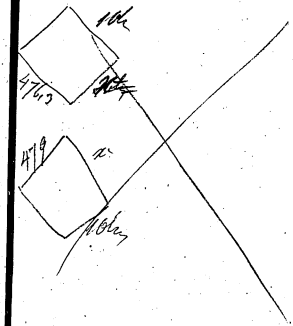
The mistake that one streetlamp was not put on the board, but was counted as with the 845 series so that we have now 846 series.

All corrections are now done and I testify that every lamp gets its coils they have to have according to the map and that all coils are correct on 14 °/oo

Hermann Cohn

18/10 1887

Measurement of the whole network.
76½ °/o



Measurement of the 4 feeders alone. 78° F.

2.7062910
2.6915250
0.0147660
0.3295938-2 = 0.4043693-2
= 0.0245244
½ = 0.3495938-2
347
66

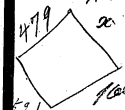
40 = ?

2.7037212
2.6946663
0.0090549
0.3895938-2 = 0.0257824
0.3991487-2 = 0.0250697
1728
117
0.0050421
2) 0.0252260 = 78°

= 0.0249796 Ohm à 78° C.
0.8865249
0.9115045

0.0249796
0.8904888
0.915447 = at 78° C.

Whole network open 4 feeders.



78° C.

0.0017175
2.6803355
0.0044448
2.6846503
2.7068377
0.0965212-1
0.0965212-1
0.0017175
2.6746076
0.0042448
2.6788524
2.7068377
2.7109901
0.0958793-1
0.0965212-1
0.0006419
0.0044
0.0975025
2) 0.0975012

0.923029
0.0017175
2.6776076
0.0042448
2.6818524
2.7109901
0.0911996

= 0.928566
0.917467
1.846033
2) 0.923016 = at 78°
0.915045
0.917512
0.0002065 Ohm
0.923016
0.915447
0.007569 Ohm
0.923016
0.915447
0.007569

Office 1889

Table readments 4 feeders

477.3 x — 520.7 Table

2.680 6074
2.776 5876
0.968 0198-1 = 0.920492
= 1.003611
g. = 0.0015843

0.912046
1.833538
0.916269 g.

523 Table — 477 x

2.6785184
2.7185017
0.960016 7-1
21 = 0.919628

g = 0.962 0250 - 1
0.001 5843
0.963 6073 - 1

2 feeders, 1880

481.7 x — 518.3 Table

2.6827766
2.714 5912
0.968 1954-1
0.001 7875
0.969 9129-1 = 0.933067
0.926
33

0.924880
1.857947
0.928673 -1

520.5 Table — 479.5 x

2.680 7886
2.716 4207
0.964 3679-1
0.001 7175
0.966 0854-1

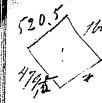
3 feeders, old places page 178

1) 326½ − 326 − ½ = 0.15 g
2) 326½ − 325½ − 1 = 0.30 g
3) 326½ − 325 − 1½ = 0.45 g
4) 326½ − 325 − 1½ = 0.45 g
5) 326 − 325½ − ½ = 0.15 g
6) 326 − 324½ − 1½ = 0.45 g
7) 325½ − 324 − 1½ = 0.45 g
8) 325 − 323 − 2 = 0.60 g
9) 325 − 322½ − 2½ = 0.75 g
10) 326½ − 325 − 1½ = 0.45 g
11) 326½ − 326½ = 0 g
12) 326 − 326 = 0 g
13) 326 − 326 = 0 g
14) 325½ − 325½ = 0.15 g
15) 325 − 325 = 0 g

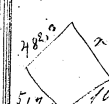
16) 325 − 324 − 1 = 0.30
17) 325 − 323 − 2 = 0.60
18) 325 − 323½ − 1½ = 0.45 g
19) 325 − 323½ − 1½ = 0.45 g
20) 324½ − 323 − 1½ = 0.45 g
21) 324½ − 324 − ½ = 0.15 g
22) 324 − 323½ − ½ = 0.15 g
23) 323½ − 323½ = 0 g
24) 323½ − 323½ = 0.15 g
25) 323 − 323 = 0 g
26) 323 − 322 − 1 = 0.30 g
27) 322½ − 323 + ½ = 0.15 g
28) 322½ − 322½ = 0 g

Measurement of outside system

3 feeders 82°F.

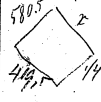


520.5 — 1669 = 0.0020501
2.6707886
2.7164207
0.969.367 — 0.921229
0.931621
7.555880
0.926425

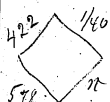


488.3 — 517.7
2.6893979
2.7140782
0.9692391-1 — 0.9668102
0.020501
0.9688603
= 0.930809 Ohm at 82°F

Coils at 82° = ~~0.888655~~ = 0.899720
3 feeders alone = 0.934581
at 82°F.



580.5 — 440
2.7638022
2.622.7930
0.141.0792 = 1.383790
1.3668
2.775458
1.3767 = q
q = 0.1388434



422 — 578
2.7619278
2.6257927
0.136.6159
at 82° = 0.0345581

System 0.930809 Coils 0.899720
— 0.925301 3 feeders 0.034581
Street mains 0.005508 0.925301

98% Coils = ~~0.949~~ 0.899720
2% Street mains 0.020243
10% Feeders - 0.101288
1.041187 = 100%

found by calculation 2% = 0.020243
" " measurement
2% = 0.005508×3 = 0.016524

Check ins

At 60°F:

Resists of the Lamps (246 Series 2750 Ohm), 88% = 0.8865249 Ohm
3 Feeders . . . . . = 10% = 0.1007414 "
Street mains . . . . = 2% = 0.0201482 "
100% = 1.0074145 Ohm

One feeder therefore: 0.3022242 Ohm

feeder I 504.9×2 = 1009.8' = 34515 circ.m. = 2200 = 10 wires
" II 2169.662 = 4339.2' = 148314 " = 7-8 " 10 "
" III 2320.84 = 4641.6' = 158649 " = 8 " 10 "
Street mains 27314.17×2 = 54628.34' = 1132779 " = 6 " 10 "

I = 109.64 - 164.46 R.
II = 469.06 - 1804.648
III 206 R

Total weight
Street mains 17794.62 R 21569.32 - 21859.28
2 26. $5608.03 - $5685.15. 2 18. $3882.48 - $3938.77.

Meriloparb 17/10 1882.

Yesterday I was informed by Dr Lemy that he had cut out at 5, but 7' wire for electrical measurement of the needle network. Therefore I represents not 339837, but 475.771 division-marks. I informed today Dr Marx. Dr Lemy about the matter and new measurement will be made with 4 feeder.

Claudius

Measurement with 4 feeder, 18/10 1882.

1/362,5 − 362+½ = 0.14%
2/362,5 − 362+½ = 0.14%
3/362,5 − 362+½ = 0.14%
4/362,5 − 362+½ = 0.14%
5/362,5 − 362+½ = 0.14%
6/362,5 − 362,5+2 = 0.55%
7/362,5 − 362,5+2 = 0.55%
8/362,5 − 362+½ = 0.14%
9/362,5 − 362,5 = 0%
10/362,5 − 362+½ = 0.14%
11/362,5 − 362,5 = 0%
12/362,5 − 362,5 − 1 = 0.28%
13/362,5 − 362+½ = 0.14%
14/362 − 362+½ = 0.14%
15/362 − 362+½ = 0.14%
16/362 − 362 − 1 = 0.28%
17/362 − 362 − 2 = 0.56%
18/362,5 − 362 − 2½ = 0.70%
19/362,5 − 362,5 − 2 = 0.55%
20/362,5 − 362,5 − 2 = 0.55%
21/362 − 362+½ = 0.14%
22/362 − 362+½ = 0.14%
23/362 − 362 = 0%
24/362 − 362+½ = 0%
25/362 − 362+½ = 0.14%
26/362 − 362 − 1 = 0.28%
27/362 − 362 = 0%
28/362,5 − 362+½ = 0.14%

Claudius

4 (either all moved or not at all)

1) 360 − 358.5 − 1½ = 0.14%
2) 360 − 358 − 1½ = 0.14%
3) 360 − 358.5 − 1½ = 0.14%
4) 360 − 358.5 − 1½ = 0.14%
5) 360 − 358.5 − 1½ = 0.14%
6) 360 − 360 − 0%
7) 360 − 359 − 1 = 0.28%
8) 360 − 358 − 2 = 0.56%
9) 360 − 357½ − 2½ = 0.68%
10) 360 − 358½ − 1½ = 0.42%
11) 359.5 − 359.5 = 0%
12) 359.5 − 358 − 1½ = 0.41%
13) 359.5 − 356 − 3½ = 0.97%
14) 359 − 355 − 4 = 1.1%
15) 359 − 355 − 4 = 1.1%

Feeder I moved:

16) 359 − 356½ − 2½ = 0.69
17) 359 − 356½ − 2½ = 0.69
18) 359 − 357½ − 1½ = 0.41%

Feeder I moved.

19) 359 − 357½ − 1½ = 0.41%
20) 357.5 − 357 − ½ = 0.14%
21) 357.5 − 356 − 1½ = 0.41%
22) 357.5 − 357.5 = 0%
23) 357.5 − 357.5 = 0%
24) 357.5 − 357 + ½ = 0.14%
25) 357½ − 357 − ½ = 0.14
26) 357½ − 356 − 1½ = 0.42%
27) 357½ − 357½ = 0%
28) 357 − 357½ + ½ = 0.14%
29) 357 − 357½ + ½ = 0.14%

Clemens

Jaggy method, at a time, changed a little

19/10 1882. The same later the test to Hutton.

1) 362.5 − 362 − ½ = 0.14%
2) 362.5 − 362 − ½ = 0.14%
3) 362 − 361½ − ½ = 0.14%
4) 362 − 361½ − ½ = 0.14%
5) 361½ − 362 + ½ = 0.14%
6) 361½ − 362 + 1 = 0.28%
7) 362 − 361 + ½ = 0.14%
8) 362 − 360 − 2 = 0.55%
9) 362 − 359½ − 2½ = 0.69%
10) 362 − 359 − 3 = 0.83%
11) 359.5 − 359½ = 0%
12) 359.5 − 359½ − 0 = 0%
13) 359.5 − 359 − ½ = 0.14%
14) 359 − 358 − 1 = 0.28%
15) 359 − 358 − 1 = 0.28%
16) 359½ − 358½ − 1 = 0.28%
17) 359½ − 358½ + 1 = 0.28%
18) 359½ − 358½ = 0%
19) 358 − 357 − 1 = 0.28%
20) 357½ − 358½ − 1 = 0.28%
21) 357½ − 358½ − 1 = 0.28%
22) 357½ − 358½ − 1½ = 0.42%
23) 357½ − 357½ = 0%
24) 357½ − 357½ = 0%
25) 357½ − 357½ = 0%
26) 357 − 357½ + ½ = 0.14%
27) 356½ − 357½ + 1 = 0.28%
28) 357½ − 357½ = 0%
29) 357½ − 357½ = 0.14%
30) 357½ − 357½ − ½ = 0.14%
31) 357½ − 356½ − 1 = 0.28%
32) 357½ − 356½ − 1 = 0.28%
33) 358 − 356 (?)
34) 358 − 357½ − ½ = 0.14%
35) 358½ − 357½ − ½ = 0.14%
36) 358½ − 356½ − 2 = 0.56%

Clemens

Jaggy method, changing

The measurement of the system and feeders today gave a negative result without due to the moisty air, so that whole the system was to have against feeders

With 3 feeders we have 1,65 % and that would be 2,2 % loss in the street mains with ~~[illegible]~~ = 339837/3 circular mils, because ratio is not more: 3, but 1:4

Every feeder has resist: 0,402 96 ohm

Length of feeders: I 730'×2 = 1460' = 36914 c.m.

II 1550'×2 = 3100' = 79468 " "

III 2907'×2 = 5814' = 149042 " "

IV 2010'×2 = 4020' = 103053 " "

Street mains length 27134'×2 = 54268'

I = 2) 10 = 10
II = 4 " 10
III = 8 " 10
IV 5 " 10
} 3754,2 ℔

Street mains 6 = 1176 773 ℔

St. Jago di Chile.

1609 Lacuna à 140 Ohms resistance.

1' German silver wire (also small wire of 5 Ohm I-Ohm)

0.0121884 Ohm resist.

Table No. 3 has one cupon 262,957 circ. mils

and 0.0000392849 Ohms per foot

therefore ratio between resistance of

Germ. silver wire and nickel table No. 3:

$$\frac{0.0121884}{0.0000392849} = 310,05$$

1 : 310

Measurements in insulation 6/11 1882.

Very good, no collection noted

high resist. Gals. and Frelli. Chundy.

0/11 1882. 2 Factors.

1) 336 − 357 + 21 = 6,2%
2) 334 − 370 + 36 = 10,8%
3) 332 − 368 + 36 = — / 352 − 345 − 339 − 351 − 4

I

1) 341 − 347 + 6 = 1,4%
2) 340 − 337,5 − 2,5 = 0,74%
3) 339 − 337,5 − 1,5 = 0,44%
4) 339 − 334 − 5 = 1,5%
5) 339 − 331 − 8 = 2,4%
6) 338 − 331 − 7 = 2,07%
7) 338 − 330 − 8 = 2,37%
8) 338 − 332 − 6 = 1,8%
9) 338 − 330 − 8 = 2,37%
10) 338 − 330 − 8 = 2,37%
11) 338 − 337,5 − ½ = 0,15%
12) 338 − 337 − 1 = 0,29%
13) 338 − 347 + 9 = 2,7%
14) 338 − 333,5 − 4,5 = 1,33%
15) 338 − 345 + 7,5 = 2,2%
16) 337,5 − 344 + 6,5 = 1,9%
17) 338 − 324 − 14 = 4,1%
18) 338 − 334 − 4 = 1,19%
19) 338 − 326 − 12 = 3,5%
20) 338 − 331 − 7 = 2,07%
21) 338 − 331,5 − 6½ = 1,9%
22) 338 − 338 − 0%
23) 338 − 336½ − 1½ = 0,43%

10/11 1882. 2 Factors, one moved. 243

11/11 1882. 2 Factors on the det. plane.
Measurement for contact:

1) 368½ − 371 + 2½ = 2,5%
5) 445 − 411 − 34 = 6,7%
7) 357,5 − 348 − 9½ = 2,8%
5) 356 − 347,5 − 8½ = 2,4%
14) 356 − 341 − 15 = 4,2%
19) 356 − 342,5 = 13,5%

13/11 1882. 2 Factors, one moved.

1) 375 − 385 + 10 = 2,6%
2) 374 − 366 − 8 = 2,1%
7) 373 − 392 + 19 = 5,1%
17) 372,5 − 356 − 16,5 = —

3 Feebers

1.) 372 - 372 = 0%

2.) 372 -

3 Feebers - 2 new bridges

1.) 362 - 358 - 4 = 1.1%

2.) 362 - 359 - 3 = 0.55%

7.) 362 - 355,5 - 9,5 = 2.6%

17.) 361,5 - 346 - 15,5 = 4.2%

20.) 361 - 354 - 7 = 1.9%

3 Feebers one bridge more.

21.) 362 - 355 - 7 = 1,5%

17.) 362 - 347 = 15

3 Feebers one month

17.) 348 - 344,5 + 3,5 = 1%

21.) 348 - 341 - 7 = 2%

7.) 347,5 - 342,5 + 5 = 1,4%

1.) 349 - 350 + 1 = 0,3%

2.) 345 - 362 + 15 = 4,3%

3.) 345 - 362 + 15 = 4,3%

4.) 345 - 353 + 8 = 2,1%

5.) 345 - 353 + 8 = 2,1%

6.) 345 - 350 + 5 = 1,4%

9.) 345 - 350 + 5 = 1,4%

6.) 345 - 352,5 + 7,5 = 2,1%

7.) 345 - 355 + 10 = 2,9%

10.) 345 - 352,5 + 7,5 = 2,1%

11.) 345 - 359 + 14 = 4,1%

12.) 344 - 359 + 15 = 4,3%

13.) 344 - 359 + 15 = 4,3%

14.) 344 - 349 + 5 = 1,4%

15.) 344 - 346 + 2 = 0,6%

16.) 344 - 346 + 2 = 0,6%

17.) 343,5 - 347,5 + 4 = 1,1%

18.) 343,5 - 350 + 6,5 = 1,8%

19.) 343,5 - 348 + 4,5 = 1,3%

20.) 343,5 - 353,5 + 10 = 2,9%

21.) 343,5 - 337 - 6,5 = 1,8%

22.) 343,5 - 343,5 = 0%

23.) 343,5 - 342 - 1½ = 0,4%

3 feebers one month.

23.) 359 - 356 - 3 = 0,8%

21.) 359 - 350 - 9 = 2,5%

12.) 358 - 357 - 1 = 0,3%

17.) 358 - 344 - 14 = 4,0%

Electors, one month, on both days.

1.) 333 – 333 = 0%
2.) 332,5 – 326,5 – 6 = 1.8%
3.) 331 – 335 + 4 = 1.2%
4.) 330 – 335 + 5 = 1.5%
5.) 330 – 328 – 2 = 0.6%
6.) 328,5 – 327,5 – 1 = 0.3%
7.) 328 – 325 – 3 = 0.9%
8.) 327,5 – 324 – 3,5 = 1.1%
9.) 327 – 325 – 2 = 0.6%
10.) 326 – 327½ + 1½ = 0.5%
11.) 325 – 324 – 1 = 0.3%
12.) 325 – 329,5 + 4,5 = 1.4%
13.) 324 – 329 + 5 = 1.5%
14.) 324 – 327 + 3 = 0.9%
15.) 322,5 – 330 – 7,5 = 2.3%
16.) 322 – 317 – 5 = 1.5%
17.) 322 – 317 – 5 = 1.5%
18.) 322 – 316,5 – 5½ = 1.7%
19.) 321 – 320 – 1 = 0.3%
20.) 321 – 316 – 5 = 1.5%
21.) 320 – 322 + 2 = 0.6%
22.) 320 – 314 – 6 = 1.8%
23.) 320 – 320 = 0%
24.) 320 – 317,5 – 2,5 = 0.8%

Electors, increase since

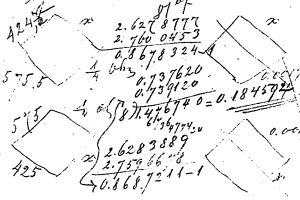
21.) 325 – 323,5 – 1½ = 0.5%
22.) 325 – 318 – 7 = 2.1%
23.) 325 – 327 + 2 = 0.6%
24.) One [illegible]

18.) 320 – 325 + 5 = 1.5%
19.) 320 – 320 = 0%
20.) 319,5 – 317 – 2,5 = 0.8%
21.) 319 – 317 – 2 = 0.6%
22.) 318 – 316 – 2 = 0.6%

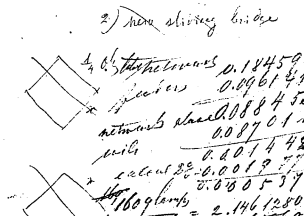
15/11 1882. Revisition at the last meeting — from yesterday:

1.) 335 – 334 – 1 = 0.3%
2.) 334,5 – 339 + 4,5 = 1.3%
3.) 334,5 – 339 + 4,5 = 1.3%
4.) 333,5 – 335 + 1,5 = 0.4%
5.) 333 – 335 + 2 = 0.6%
6.) 333 – 332 – 1 = 0.3%
7.) 332 – 332 = 0%
8.) 332 – 333 + 1 = 0.3%
9.) 331,5 – 335 + 3,5 = 1.0%
10.) 331 – 332,5 + 1½ = 0.4%
11.) 330,5 – 335,5 + 5 = 1.5%
12.) 330 – 335 + 5 = 1.5%
13.) 330 – 332 + 2 = 0.6%
14.) 330 – 330 = 0%
15.) 329,5 – 327 – 2,5 = 0.7%
16.) 329 – 327 – 2 = 0.6%
17.) 329 – 329 = 0%
18.) 328 – 329 + 1 = 0.3%
19.) 328 – 329,5 + 1,5 = 0.4%
20.) 328 – 335 + 7 = 2.1%
21.) 327 – 326 – 1 = 0.3%
22.) 327 – 327 = 0%
23.) 327 – 325 – 2 = 0.6%

Measurement of the whole system. 1) Old sliding bridge:

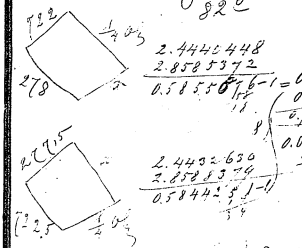


2) New sliding bridge

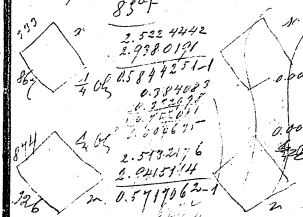


3 Feeders alone.

1) Old sliding bridge. 82°



2.) New sliding bridge. 85°F



88% lamps (1600) .... 0.087011 Ohm
2% directrices ... 0.001978
10% tubes ... 0.009886
100% = 0.098876 Ohm

Not reduced temperature!
Measurement by the sliding bridge:
Total system: 0.184594 Ohm

1600 lam.: à 40 Ohm = 0.087011
3 feeders ... = 0.096141 — 0.183152 "
for directrices remain: 0.001442 Ohm

allowed as test 2%: 0.001978 Ohm
in reality: 0.001442 "
excess: 0.000536 Ohm
or 37% instead of the required 20%

Resistance of one feeder 0.029661 Ohm
5707.65
$ 5707.65
250 65
for 52 + 20' = 1040' à 270 ... 6078.45
Not (for distribution $7.) + 10% 607.84
$ 6686.31

tube I 288'×2 = 576' = 200603 circ. mils } 1600 lamps
" II 492'×2 = 984' = 342697 " " }
" III 873'×2 = 1746' = 608078 " "
(Remark: 253 for circular mils)
For 2000 lamps:
feeder I. 288 à $0.80 = $ 230.40
15 boxes à $5 ... 75.—
$ 305.40.
Not: 3 tubes (+10%)
tube II. 492 à $1.50 = $ 738.—
25 boxes à $5 ... 125.—
" 863.—
Not: 2¾ tube (+8%) 1964.25
(less $2.25)
feeder III ~~1746~~ 873' à $1.25 = $ ~~1181.05~~ 2184.25
44 boxes à $5 ... 220.—
~~1835.05~~
Not: 2½ tube (+10%)
(less $2.73)
Directrices 1975 à $0.80 = $ 1580.—
Under
Not: 3 tube 80 boxes à $5 = 400.—
2075.—
(for $2.)
Extra boxes on corners 22 à $5 ... 110.—
$ ~~5188.45~~ 5537.65
Total
Limit $ 8000.— at Dell-Vista
Cost ~~6686.31~~ $ ~~5707.65~~
Profit $ ~~1313.69~~ = lessons learned 250.—
$ ~~5707.65~~ 5797.65

Resistances corrected to 81½°F.

Coils 0.087413 Ohms
3 feeders 0.096584 "
0.183997 Ohms

Total system = 0.185446 Ohms
substracted 3 feeders and coils = 0.183997 "
remain for street mains = 0.001449 Ohms
at that corrected temperat. = 0.001442 "
Difference 0.000007 Ohms

therefore all right.
Manchesterstr. Hornberg 16th 1882
Dorman Cambridge.

Taken 2000 Lamps:
2000 Lamps à 140 Ohms 88% = 0.070000 Ohms
2% = 0.001591 "
10% = 0.007954 "
100% = 0.079545 Ohms

One feeder therefore 0.023862 Ohm resist.

feeder I 576' = ~~266266~~ 249354 (249354) resistance
" II 934' = ~~444096~~ 425976 " "
" III 1746' = ~~806614~~ 755854 " "
} 2000 lamps

2% with 2000 lamps = 0.001591 Ohms
in reality " = 0.001442 "
excess = 0.000149 Ohms
= 10.3% of the 2000 lamps

But we must consider street mains only for 1609 lamps with 2% = 0.001928
and we have an excess pass 2% of 37%
Feeders are calculated for 2000 lamps.

Genehin

Fritz.

New prices of tubes etc.

Lucia I 288' à $1.— ... $288.—
No. 3 tube
15 boxes à $3 — ... 45.— ... $333.—

Lucia II 492' à $1.45 ... $713.40
No. 2½ tube
25 boxes à $3 — ... 75.— ... 788.40

Lucia III 873' à $2.35 ... $2051.55
No. 2 tube
42 boxes à $3. ... 132.— ... 2183.55

Strachmains 1975' à $1. ... $1975.—
No. 3 tube
99 boxes à $3 — ... 297.— ... 2272.—
Extra boxes for corners 22 à $3 ... 66.—
Service boxes 52 à $3 — ... 156.—
Tubes No. 2. 52 x 20' = 1040' à $.25 ... 260.—
$ 6058.95
+ 10% ... 605.89
$ 6664.84

Limit $ 8000.—
— 6664.84.
saved $ 1335.16

All tubes galvanized:

Lucia I now 288' à 9.95 = $28.51.
" II " 492' à 17.25 = 84.87
" III " 873' à 22c = 192.06
Strachmains 1975' à 9.95 = 195.53 ... $ 500.97

highest prices on price list—

Lucia II 492' à 12c now ... $ 59.04
" III 873' à 22c " ... 192.06 ... 251.10
$ 752.07
page 254 ... 6058.95
$ 6811.02
+10% 681.10
$ 7492.12

Limit $ 8000.—
— 7492.12
saved $ 507.88

Highest prices, not galvanized $ 6310.05
+ 10% 631.—
$ 6941.05

Limit $ 8000.
— 6941.05
saved $ 1058.95

New prices for this table, not galvanized:

Tubes I and boxes $ 933. —.
" II " " " 847.44
" III " " " 2375.61
Specimens and boxes " 22[illegible]. —
6 extra and Service boxes = 222. —
Tubes No. [illegible] 260. —

Σ $ 6[illegible]. 05
+ 10% 631. —
Σ $ 6941. 05

Limit $ 8000. —
− 6941.05
Saved $ 1058.95.

1844 Lamp à ~~[illegible]~~ 217 Ohm, three wire system
1 foot of German silver wire, annealed, =
0.013571 Ohm D = 0.1075"
ratio with nature = 1 : 250
represents boiler 190346 cubic mils
G.P. No. 2 = 66573 cubic mils
" " 3 = 67081 "
$\frac{190346}{3}$ = 63[illegible] cubic mils
Reading of galvanometer therefore 3% amps
1% in nature, consuming size of wire.
Coil of metrique represent 140 Ohm, in series
280 Ohm, in nature 208 × 2 = 416 Ohm
1% =
Reading of galvanometer 1.48 or 1.5% in nature
Therefore: wire 3 : 1
Amps 1 : $1\frac{1}{2}$
Energy 3 : $1\frac{1}{2}$ or 1 : $\frac{1}{2}$
$\frac{1}{2}$% reading = 1% in ~~nature~~.

Lamps connected:
upper wire
lower wire } total 217 Ohm

Measurement of Branch 21st 1883

258

12 feet.

Pile upper 240 } with whole Stn
Lower 245,5 } network

1st 240 – 241,5
245,5 – 247,5

1b 240 – 242
245,5 – 246

2 246 – 242
246 – 247,5

3. 240,5 – 242,5
247 – 248,5

4. 241 – 242
247,5 – 248,5

5. 241,5 – 242,5
248 – 248,5

6 242 – 243
248,5 – 249

7 242,5 – 242
249 – 248,5

8 242,5 – 241
249,5 – 248,5

9. 243 – 241,5
250 – 248

10. 243,5 – 242,5
250,5 – 248

11. 244 – 242,5
251 – 251,5

12. 245 – 244,5
252 – 248

13 245,5 – 244
252,5 – 252,5

14 246 – 242,5
253 – 252,5

15. 246,5 – 246,5
253,5 – 253,5

16. 247 – 244,5
253,5 – 253,5

17. 247,5 – 245,5
254 – 252,5

18. 247,5 – 246,5
254,5 – 253

19. 248 – 246,5
255 – 253,5

20. 248,5 – 247,5
255,5 – 255

21. 248,5 – 246,5
255,5 – 258

22. 249 – 248
256 – 258

23. 249 – 248,5
256 – 258

24. 249,5 – 249
256,5 – 255,5

259

25. 249,5 – 246
256 – 257,5

26. 182,5 – 178
188,5 – 188

March 22nd 1883, Measured 25 lamps near station 25 from upper mile and connected to lower mile Feeders. Should be cut at all planes but feeder. 12 mas. measured ∓ 8 inches to left and mark planes at all planes, again may under.

Pile upper 249
Lower 257,1

Measurement begun with station 26, pile Abercrom siding, not going down, hence lower appears.

1 e vigin 261,5 − 262,5Δ + 1 = + 0.38 ‰
Ibum 250 − 250

1 E 260.5 − 262,5Δ + 2 = + 0.77 ‰
250 − 250

2. 260,5 − 262Δ + 1,5 = 0.57 ‰
249,5 − 250Δ + 0,5 = 0.20 ‰

3. 260 − 261.5 Δ + 1.5 = + 0.58 ‰
249 − 250,5 Δ + 1.5 = + 0.60 ‰

4. 259 − 260Δ + 1 = + 0.38 ‰
248.5 − 249,5Δ + 1 = + 0.40 ‰

5. 258.5 − 259.5Δ + 1 = + 0.38 ‰
247.5 − 248 Δ + 0.5 = + 0.20 ‰

6 257.5 − 258.5 Δ + 1 = + 0.39 ‰
246,5 − 247.5 Δ + 1 = + 0.40 ‰

7. 257,5 − 257 Δ − 0.5 = − 0.19 ‰
246,5 − 246 Δ − 0.5 = − 0.20 ‰

8. 256.5 − 254.5Δ − 2 = − 0.78 ‰
245,5 − 245,5

9. 255,5 − 253.5 Δ − 2 = − 0.78 ‰
245 − 243,5 Δ − 1.5 = − 0.61 ‰

10. 255 − 253.5 Δ − 1,5 = − 0.58 ‰
245 − 242 Δ − 3 = − 1.22 ‰

11. 255 − 253.5 Δ − 1.5 = 0.58 ‰
244 − 244,5 Δ + 0.5 = + 0.20 ‰

12. 254,5 − 254 Δ − 0.5 = − 0.19 ‰
244 − 240.5 Δ − 3,5 = − 1.43 ‰

13 253,5 − 252.5 Δ − 1 = − 0.39 ‰
243,5 − 243,5

14. 253 − 249,5 Δ − 3.5 = − 1.38 ‰
242,5 − 242,5

15. 252,5 − 252,5
242,5 − 242,5

16. 252,5 − 249,5 Δ − 3 = − 1.19 ‰
242 − 241 Δ − 1 = − 0.41 ‰

17. 251,5 − 250 Δ − 1,5 = − 0.59 %
251,5 − 240 Δ − 1,5 = − 0.62 %

18. 251,5 − 250 Δ − 1,5 = − 0.59 %
241 − 240 Δ − 1 = − 0.41 %

19. 252,5 − 248,5 Δ − 2 = − 0.79 %
240,5 − 239,5 Δ − 1 = − 0.41 %

20. 250 − 251,5 Δ + 1,5 = + 0.60 %
240 − 239,5 Δ − 0,5 = − 0.21 %

21. 249,5 − 247,5 Δ − 2 = − 0.80 %
239,5 − 242 Δ + 2,5 = + 1.04 %

22. 249 − 248 Δ − 1 = − 0.40 %
238 − 240,5 Δ + 1,5 = + 0.62 %

23. 248,5 − 245,5 ———
238,5 − 240 Δ + 1,5 = + 0.62 %

24. 248 − 250 Δ + 2 = + 0.82 %
238 − 236,5 Δ − 3,5 = − 1.47 %

25. 247,5 − 247,5 ———
237,5 − 237,5 Δ − 7 = − 1.56 %

26 247,5 − 245,5 Δ − 2 = − 0.81 %
237,5 − 235 Δ − 2,5 = − 1.05 %
Results 24th 1883
Faces 12 planes at 60 plane.

26. 207,5 − 205 Δ − 2,5 = − 1.20 %
203 − 200 Δ − 3 = − 1.45 %

25. 209 − 209 ———
204 − 202 Δ − 2 = − 0.98 %

24 209,5 − 211,5 Δ + 2 = + 0.95 %
204,5 − 202 Δ − 2,5 = − 1.22 %

14 211 − 207,5 Δ − 3,5 = − 1.66 %
206,5 − 203 ———

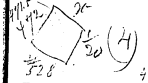
The greatest loss is at station 14 = 1,65 % or taken the mean of any 2 stations about 1,5 %, in station 3 %.

To get 2 % we must increase settlement mean of carriage from 6,3448 to 2 : 3 = 6.5448 ft. (by Table = 9122 c.m.)
x = 95175 circumferential equal
To do 0 @ 9 (105534 circ. mils)
" 1 " 3 (pounds)

Continuation of Shunting Special Book.

5 feet long samples of Bonner Silver-Mines for mechanics.

Roll X. D = 0.135"



472 = 2 · 6 · 59 · 4 · 20

528 = 2 · 2 · 2 · 3 · 3 · 3 · 11

130 891 − 1 = 0.0893940

0.0892248

0.0178608

471.5 = 2 · 6 · 3 · 7 · 8 · 7

528.5 = 3 · 2 · 3 · 7 · 4 · 5

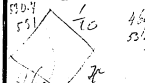
124 367 − 1 = 0.0089274

0.0089274

0.0089274 − 3

f = 0.9508728 − 3

Roll IX D = 0.135"



469 = 2 · 5 · 7 · 19 · 8

551 = 2 · 7 · 5 · 5 · 6 · 6 · 5

176 872 − 1 = 0.0088240

0.0088240

0.0176544

0.0088272

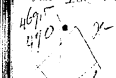
469.3 = 2 · 6 · 7 · 4 · 5 · 6

550.7 = 2 · 5 · 5 · 4 · 4 · 1

176 601 − 1

f = 0.9463403 − 3

Экс. XIII. $D = 0.133''$

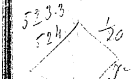


$490 = 2 \cdot 6720979$
$530 = 2 \cdot 7242759$
$\overline{.9478220} - 1 = 0.0886793$
$0.088504''$

$469.5 = 2 \cdot 6716356$
$530.5 = 2 \cdot 7246857$
$\overline{.9463502} - 1 = 0.0088503$

$\rho = 0.9473862 - 3$

Экс. XIII. $D = 0.1325''$

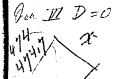


$476 = 2 \cdot 6776070$
$524 = 2 \cdot 7193513$
$\overline{.958} = 7.5 - 7 = 0.0908397$
$0.090909 = 0$
$1619 = 54$

$476.7 = 2 \cdot 6782452$
$523.3 = 2 \cdot 7187507$
$\overline{.9594959} - 1 = 0.009095 - 3$

$\rho = 0.9 = 88853 - 3$

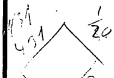
Экс. III $D = 0.132''$



$479 = 2 \cdot 6809723$
$526 = 2 \cdot 7209857$
$\overline{.9619926} - 1 = 0.0901140$
0.0903672
$180481 2$

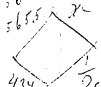
$474.7 = 2 \cdot 6761419$
$523.3 = 2 \cdot 7190407$
$\overline{.9561818} - 1 = 0.0091136$
$\rho = 0.9 = 4020 - 3$

Экс. IV $D = 0.110''$



$569 = 2 \cdot 7551423$
$451 = 2 \cdot 6377473$
$\overline{.1173950} = 0.0132018 - 7$

Rule IV D = 0.110"

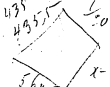


565.5 = 2.752 4700
434.7 = 2.638 1896
.1140804 = 0.1300467
0.1301495
D = 0.01931

565.5 = 2.752 4326
434.5 = 2.637 9898
.1144428 = 0.1300966 = IV

f = 0.1132659 − 2

Rule III D = 0.110"

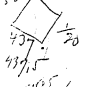


565 = 2.752 0484
435 = 2.638 4593
.1135891 = 0.1208050
0.1208212
D = 0.01293 = III

565.5 = 2.751 6639
435.5 = 2.638 9082
.1127557

f = 0.113 1177 − 2

Rule II D = 0.111"

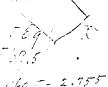


563 = 2.750 5604
437 = 2.640 4614
.1100990 = 0.1288350
0.1285714

562.5 = 2.750 1212
437.5 = 2.640 6768
.1094444 = 0.01287022 = II

f = 0.1097859 − 2

Rule I D = 0.111"



562 = 2.749 4123
430 = 2.633 4937
.1159186 = 0.1320186
0.1322290

562.5 = 2.749 8666
431 = 2.634 0966
.1157700 = 0.0129215553 = I

562.5 = 2.755 4997
430.5 = 2.633 9792
.1215205

f = 0.1215040 − 2

= 17.5 − 5.8 cm

280

11 - 12 Marlow

13 - 18 Roselle

19 Marlow Roselle

20 〃 〃

21 〃 〃

22 〃 〃

23 - 30 Roselle

Last measurement of the Roselle Lines.

27/9 1882

	%
St 1	= 0
St 2	= 0
St 3	= 0.
St 4	= 0
St 5	= +0,303
St 6	= +0,454
St 7	= −0,606.
St 8	= −0,757.
St 9	= −0,909
St 10a	= +0,454
St 10b	= 0
St 11	= +0,151
St 12	= 0
St 13	= 0,3
St 14	= 0
St 15	= 0
St 16	= 0
St 17	= −0,15
St 18	= −0,454
St 19	= −0,303
St 20	= −0,303
St 21	= −0,15
St 22	= −0,15
St 23a	= 0
St 23b	= +0,15
St 24a	= −0,15
St 24b	= 0
St 25	= −0,15
St 26	= −0,15
St 27	= +0,3
St 28	= +0,15

Marks north the 27/IX/82

[ITEM FOUND IN BOOK]

$\frac{0.01776035}{584.5} = y$

$\frac{10.33}{x}$ = x circumferential [illegible]

$\frac{10,33 \times 584,5}{0.01776035} = x$

1.0141003
2.766 7845
3.7808 848
÷ 0.2496149

5.5312599 = 339837 Circular inches of copper, represented by the German silver wire on the Roselle network.

[ITEM FOUND IN BOOK]

1 Feeder for 18/1 1883
Left 7 x 7 Distant 6 cents
with 8 Bulbs

$m = 7\frac{5}{16}$ in $= 68°$ F

$C = \cancel{0.0245754}$
$g = \cancel{0.3858800}$
$g = 0.3893427 - 2$ at 0°C
$g\,0°C = 20\frac{1}{2}$°C

607.3 592.5
605 – 595

$x = \cancel{0.0248275}$ at 0°C
$x = \cancel{0.0247977}$ – 20°C
$x = 0.0250246$ at 20½°C

x 0.024462 – C
6 x

$g\,\frac{140}{990} = 0.1870866 - 1$

Nuly $= 0.1538461 = 910$ lumpers
0.0250246
0.1788706
0.1538461
88

$g\,1.538461 = 1.1870866$
$g\,88 = 1.9444827$
$0.2426039 - 1$

Nuly $= 0.1748251$
$0.1748251 : 0.001105 = 100 : x$
$g\,0.1105 = 0.0433623 \ldots x = 0.1105$
$g\,0.17 = 0.2426039 - 1$
$0.8007584 - 1$ 0.1748251
0.63206 %.

Compt. of Hens: 20 cents counter: 0.6320 %

22/1 1883

Hens 1, 910 L.
6 24/4

0.2 Gb
$= 0.0007654$ at 66°F (20.5°C)
$g = 0.3018645 - 1$

473.3 = 2.6751365
526.7 = 2.7215635
0.9535532 – 1
0.3018645 – 1
0.2516887 – 1
0.1800684
0.1808844
0.3608428
2) 0.4866648 Total Hens
0.1803214

474 = 2.6757783
526 = 2.7209857
0.9542926 – 1
0.3018645 – 1
0.2524281
1.146
145
98.6
48.6

286 Distributed
910 Lumpers

22/1 1883

663 = 2.8215435
537 = 2.7299743
0.0915392
0.3997127 – 2
0.4808519 – 2
666 = 2.8235742
534 = 2.7275413
0.0959329
0.3997127 – 2
0.4852456 – 2
766

1) 0.0302588
0.0305665
0.0608253

2) 0.0341261
0.0279990
0.0621186

88 : 0.297 | 10.0034
330
0.000034
0.000003

[ITEM FOUND IN BOOK]

1200

[ITEM FOUND IN BOOK]

[ITEM FOUND IN BOOK]

Ch. Mitri Block I 90 Lamps 68 C.F.

22/1.1883

[ITEM FOUND IN BOOK]

0.886524990 = 88%
0.100741 = 10%
1.020148 = 2%
1.0374148

6 = 0.0476909 − 1
1.0476909
1.944482 − 50
0.002307 = 1.007441 = 100%

0.3022242

55 = 0.8100744
72.8

32.59
7.61
7.86
7.86
37.57

I = 504.9 x2 = 1009.8 × 10.33
3029.4
3029.4
10431.234 = 4.0183556
0.3022242 = 0.4802292 − 1
4538.0064

32.32
7.61
7.86
57.62.48

Weight = 1.0098 × 54.29 = 54.82 x2
72.861
72.861
709.648
764.468 ×3

II = 2169.6 x2 = 4339.2 × 10.33
1301.76
1301.76
44823.936 = 4.651 5400
0.3022242 − 0.4802292 − 1
5.171 1808
108.58

5009
87.3
2.91
0.302
5097.77 = 448314 cm.

III = 2320.84 x2 = 4641.6 × 10.33
13924.8
13924.8
47947.128 = 4.6807680
0.3022242 − 0.4802292 − 1
5.2004388
127
26.1

7614
6.7
7.82
0.522
7680.522 = 158649 cm

115
72
747

[ITEM FOUND IN BOOK]

0.926425
0.920949
0.005476
0.005508
0.000126

0.8865248
0.0344182
#920943 1

0.13767 29
4) 0.0344182

100:55 = 1.818
55
65
9.745

55:100 = 1.1.2
136/2.26
= 0.6
100

USE ONLY WHEN PHOTOCOPYING

[ITEM FOUND IN BOOK]

Shamokin P.A.

Length of feeders.

with 12 feeders.

feeder	Single Length.	3 feed.	
1	2907 feet	8721	84026
2.	2114 "	6342	61105
3.	1621 "	4863	46855
4.	1177 "	3531	34021
5.	1138 "	3414	32897
6	672 "	2016	19424
7.	200 "	600	5781
8.	666 "	1998	19251
9	983 "	2949	28413
10.	1430 "	4290	41354
11.	2427 "	7281	70153
12	3005 "	9015	86859
	9173		
	~~10534~~		circ. mil 6 in 202 Ohs Bare
	~~1361~~ 6		" " 217 "
	19276		

Single length of street wires — 9195 feet.
3 feed " " " = 27585 "

with 6 feeders.

feeder	Single Length.		
I	2631 feet	7893	150996 circ. m
II	1402 "	4206	80462 "
III	672 "	2016	38567 "
IV	719 "	2157	41264 "
V	1737 "	5211	99688 "
VI	3162 "	9486	181470 "

No. O. Q. G = 105534 C.m.